

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

- 1 1. (original) A method for forming a photonic-crystal filament, the method
2 comprising the steps of:
 - 3 a) mixing a slurry comprising particles of substantially uniform size and a
4 precursor material for a desired metal;
 - 5 b) urging the slurry through an orifice to force the particles and precursor
6 material into a combination having a desired crystallographic configuration;
 - 7 c) drying the combination emerging from the orifice; and
 - 8 d) sintering the precursor material, whereby a photonic-crystal filament is
9 formed.
- 1 2. (original) A photonic-crystal filament made by the method of claim 1.
- 1 3. (original) The method of claim 1, further comprising the step of:
2 e) compressing the slurry.
- 1 4. (original) The method of claim 1, further comprising the step of:
2 f) heating the dried combination to remove the particles.
- 1 5. (original) The method of claim 4, wherein the heating step f) and the sintering
2 step d) are performed simultaneously.
- 1 6. (original) The method of claim 1, wherein the particles comprise an inert
2 material.
- 1 7. (original) The method of claim 1, wherein the precursor material comprises a
2 metal oxide.

1 8. (original) The method of claim 1, further comprising the step of:

2 g) reducing the precursor material to metallic form.

1 9. (original) The method of claim 8, wherein step g) of reducing the precursor
2 material comprises heating the precursor material in a reducing environment.

1 10. (original) The method of claim 9, wherein the reducing environment comprises
2 a gas selected from the list consisting of hydrogen, forming gas, a carbide gas,
3 acetylene, and mixtures thereof.

1 11. (original) The method of claim 1, further comprising the step of:

2 h) providing a core filament and feeding the core filament through the orifice
3 while urging the slurry through the orifice to force the particles and precursor material
4 into a combination surrounding the core filament.

1 12. (original) The method of claim 11, further comprising the step of:

2 i) passing an electric current through the core filament, whereby the core filament is
3 heated.

1 13. (original) The method of claim 12, wherein the electric current heats the
2 precursor material to an effective temperature for sintering the precursor material.

1 14. (original) The method of claim 11, further comprising the step of:

2 j) removing the core filament after the precursor material is sintered.

1 15. (original) The method of claim 1, further comprising the step of:

2 k) compressing the precursor material within a sheath.

1 16. (original) The method of claim 15, wherein the sheath comprises a metal.

1 17. (original) The method of claim 16, wherein the metal of the sheath comprises
2 copper.

1 18. (original) The method of claim 15, wherein step k) of compressing the precursor
2 material is performed by drawing the sheath through at least one die.

1 19. (original) The method of claim 18, wherein step k) of compressing the precursor
2 material is performed by drawing the sheath through a series of two or more
3 successively smaller dies.

1 20. (original) The method of claim 15, wherein the sheath comprises a gas-
2 permeable material.

1 21. (original) The method of claim 15, further comprising the step of:
2 l) removing the sheath after the precursor material is sintered.

1 22. (original) The method of claim 15, further comprising the step of:
2 m) providing a core filament and feeding the core filament through the orifice while
3 urging the slurry through the orifice to force the particles and precursor material into a
4 combination surrounding the core filament and while compressing the precursor
5 material within the sheath.

1 23. (original) The method of claim 22, further comprising the step of:
2 n) removing the sheath after the precursor material is sintered.

1 24. (original) The method of claim 22, further comprising the step of:
2 o) removing both the sheath and the core filament after the precursor material is
3 sintered.
4

- 1 25. (original) A photonic-crystal filament made by the method of claim 15.
- 1 26. (original) The method of claim 1, wherein the desired metal is a refractory
2 metal.
- 1 27. (currently amended) The method of claim ~~[[27]]~~26, wherein the refractory metal
2 is selected from the list consisting of tungsten, platinum, tantalum, molybdenum,
3 and alloys thereof.
- 1 28. (original) The method of claim 1, wherein the desired metal is tungsten or an
2 alloy thereof.
- 1 29. (original) The method of claim 1, wherein the precursor material comprises an
2 oxide of tungsten.
- 1 30. (original) The method of claim 1, wherein the precursor material comprises
2 peroxopolytungstic acid.
- 1 31. (original) The method of claim 1 wherein the particles comprise substantially
2 spherical particles.
- 1 32. (original) The method of claim 1 wherein the particles comprise non-spherical
2 particles.
- 1 33. (original) The method of claim 1 wherein the particles comprise polymer
2 particles.
- 1 34. (original) The method of claim 1 wherein the particles comprise polymer
2 nanospheres.

1 35. (original) The method of claim 34, wherein the polymer particles comprise a
2 material selected from the list consisting of polystyrene, polyethylene,
3 polymethylmethacrylate (PMMA), latex, and combinations thereof.

1 36. (original) The method of claim 1, wherein the photonic-crystal filament has a
2 desired photonic band-gap, and the substantially uniform size of the particles is
3 adapted to provide the desired photonic band-gap.

1 37. (currently amended) The method of claim ~~[[37]]~~ 36, wherein the desired
2 photonic band-gap has a lower wavelength edge and the substantially uniform size
3 of the particles is chosen to be about one-quarter the value of the lower wavelength
4 edge of the desired photonic band-gap.

1 38. (currently amended) The method of claim ~~[[37]]~~ 36, wherein the desired
2 photonic band-gap corresponds to a wavelength between about 400 nanometers and
3 about 7000 nanometers.

1 39. (currently amended) The method of claim ~~[[37]]~~ 36, wherein the desired
2 photonic band-gap corresponds to a wavelength between about 1200 nanometers and
3 about 1800 nanometers.

1 40. (original) The method of claim 1, wherein the photonic-crystal filament has a
2 longitudinal axis and a selected crystallographic axis of the desired crystallographic
3 configuration is aligned parallel to the longitudinal axis of the photonic-crystal
4 filament.

1 41. (original) A lamp filament made by the method of claim 1.

1 42. (original) An incandescent lamp comprising a photonic-crystal filament made
2 by the method of claim 1.

1 43. (original) A light source comprising the incandescent lamp of claim 43.

1 44. (original) A method of cladding a metal filament, the method comprising the
2 steps of:

3 a) providing a metal filament;

4 b) mixing a slurry comprising particles of substantially uniform size and a
5 precursor material for a desired metal;

6 c) urging the metal filament and the slurry through an orifice to force the
7 particles and precursor material into a combination having a desired crystal
8 configuration surrounding the metal filament;

9 d) drying the combination emerging from the orifice;

10 e) sintering the precursor material; and

11 f) compressing the precursor material within a sheath, while drawing the filament
12 through a series of two or more successively smaller dies, whereby the filament is
13 clad with a photonic crystal.

1 45. (currently amended) The clad filament formed by the cladding method of claim
2 ~~[[45]]~~ 44.

1 46. (currently amended) The method of claim ~~[[45]]~~ 44, further comprising the step
2 of:

3 g) compressing the slurry.

1 47. (currently amended) The method of claim ~~[[45]]~~ 44, further comprising the step
2 of:

3 h) heating the dried combination to remove the particles.

1 48. (currently amended) The method of claim ~~[[48]]~~ 47, wherein the heating step h)
2 and the sintering step e) are performed simultaneously.

1 49. (currently amended) The method of claim ~~[[45]]~~ 44, wherein the particles
2 comprise an inert material.

1 50. (currently amended) The method of claim ~~[[45]]~~ 44, wherein the precursor
2 material comprises a metal oxide.

1 51. (original) A photonic crystal for covering a filament core, the photonic crystal
2 comprising:

3 a first refractory metal substantially filling interstitial spaces between a set of
4 substantially spherical voids disposed in a predetermined crystallographic lattice,
5 the set of spherical voids being disposed surrounding the filament core.

1 52. (currently amended) The photonic crystal of claim ~~[[52]]~~ 51, wherein the
2 filament core comprises a second refractory metal.

1 53. (currently amended) The photonic crystal of claim ~~[[53]]~~ 52, wherein the first
2 and second refractory metals comprise different metals.

1 54. (currently amended) The photonic crystal of claim ~~[[53]]~~ 52, wherein the first
2 and second refractory metals comprise the same metal.

1 55. (currently amended) The photonic crystal of claim ~~[[53]]~~ 52, wherein the first
2 and second refractory metals both comprise tungsten or an alloy thereof.

1 56. (currently amended) The photonic crystal of claim ~~[[52]]~~ 51, further comprising
2 a filling material disposed within the spherical voids, the filling material differing in
3 refractive index from the first refractory metal.

1 57. (currently amended) The photonic crystal of claim ~~[[57]]~~ 56, wherein the filling
2 material substantially fills the spherical voids.

1 58. (currently amended) The photonic crystal of claim ~~[[52]]~~ 51, wherein the
2 filament core has a longitudinal axis and a selected crystallographic axis of the
3 predetermined crystallographic lattice is aligned parallel to the longitudinal axis of
4 the filament core.

1 59. (currently amended) The photonic crystal of claim ~~[[52]]~~51, wherein the first
2 refractory metal comprises tungsten or an alloy thereof.

1 60. (original) A method of using a photonic crystal to reduce emission of selected
2 wavelengths of radiation from a filament, the method comprising the steps of:

3 a) providing a core filament and an electrical input connected to the core filament;
4 and

5 b) cladding the core filament with a photonic crystal material which is operable to
6 reduce emission of selected wavelengths of radiation during the resistance heating of
7 the filament when electrical energy is conducted to the input and to the core
8 filament.

1 61. (currently amended) The method of claim ~~[[61]]~~ 60, wherein the core filament
2 has a longitudinal axis and the photonic crystal material has crystallographic axes,
3 the method further comprising the step of aligning a selected one of the
4 crystallographic axes of the photonic crystal material parallel to the longitudinal axis
5 of the core filament.

1 62. (original) A method for filtering light from a light source having a longitudinal
2 axis, comprising the steps of:

3 a) providing a photonic crystal having a predetermined crystallographic axis and a
4 photonic band-gap adapted to block selected wavelengths of light; and

5 b) surrounding the light source with the photonic crystal while aligning the
6 predetermined crystallographic axis parallel to the longitudinal axis of the light
7 source.

1 63. (original) A filament comprising, in combination:

2 a) elongated filamentary means for emitting radiation in a range of wavelengths in
3 response to resistance heating; and

4 b) means for filtering, surrounding the filamentary means for emitting radiation, the
5 filtering means comprising a photonic crystal, the photonic crystal being disposed
6 surrounding the filamentary means for emitting radiation, and the photonic crystal
7 having a band-gap adapted to reduce the emission of selected wavelengths at least
8 partially within the range of wavelengths.

1 64. (original) An electrical device comprising:

2 a) a support,
3 b) a transparent envelope secured to the support and forming an enclosure therewith,
4 c) a filament having a metal core portion, and
5 d) an input for electrical energy secured to the support and electrically coupled to the
6 filament, the metal core portion of the filament being coated with a photonic crystal
7 material which is effective in reducing emission of selected wavelengths of radiation
8 during the resistance heating of the filament when electrical energy is conducted to
9 the input and to the metal core portion of the filament.

1 65. (currently amended) The electrical device of claim ~~[[65]]~~ 64, wherein the
2 selected wavelengths of radiation are selected infrared wavelengths and the photonic
3 crystal material has a photonic band-gap corresponding to the selected infrared
4 wavelengths.

1 66. (currently amended) The electrical device of claim ~~[[65]]~~ 64, wherein the metal
2 core portion of the filament has a longitudinal axis, the photonic crystal material has
3 crystallographic axes, and a selected one of the crystallographic axes of the photonic
4 crystal material is aligned substantially parallel to the longitudinal axis of the metal
5 core portion of the filament.